

inherently resistant to taboo interference. In addition, introducing advanced receivers which offer consumers ATV quality performance and improved resistance to taboos would represent a far more efficient means of improving the performance of present receivers.

Third, the concept of "VHF reference performance" is not a valid means of evaluating the vitality of UHF taboos. NOI, at ¶ 74-76. The objective of the UHF taboos is to protect viewers from unacceptable levels of interference to their UHF reception. Accordingly, the only proper method for evaluating the taboos, or other interference effects, is to conduct subjective tests to determine at what level the interference impinges on viewer acceptability. See B.L. Jones, "Subjective Assessment of Protection Ratios For UHF Broadcast Signals," Report 4/86, CBS Technology Center, April 23, 1986 ("CTC Report"); Final Report, Land Mobile Radio/UHF Television Technical Advisory Committee, May 7, 1986, at III.B, p. 3-4.^{30/} These tests have demonstrated that television viewers are substantially more demanding than the subjects of the thirty-year old tests that the Commission has used in the past to set interference

^{30/} In order to permit repeatability in these tests a two-step process is used in which (1) a determination of the "just-perceptible" level of interference is made, and then (2) the difference between the "just-perceptible" value and "acceptable" level of interference is measured in a separate set of subjective tests.

criteria. See B.L. Jones, A. Kaiser, "Critique of the 'Equal Objectionability' Criterion and Experimental Methodology" (July 23, 1987) (filed with Further Reply Comments of NAB in Gen. Docket 85-172).

The apparent objective of the "VHF reference performance" concept, on the other hand, is to extend any degradation caused by taboo effects in the VHF band to UHF stations. The reference concept is based on the premise that if UHF reception for a taboo is not as severely degraded as the reception for VHF channel combinations that parallel the UHF taboo (the "VHF reference") then UHF performance can be further degraded by relaxing the taboo. NOI, at ¶ 74; H. Davis, "A Study of UHF Television Receiver Interference Immunities," FCC Office of Engineering and Technology.^{31/} Viewers' perceptions are ignored; no consideration is given to whether the VHF performance which is used as a reference represents an acceptable level of picture quality or contains more interference than viewers are willing to tolerate. The study is based on the premise

^{31/} Because of the flaws in the premise of this study and the need to await further information on ATV systems before reevaluating the taboos, MST is not offering a comprehensive critique of this study at this time. MST notes, however, that the data reported reflect measurements of median receiver levels. MST has noted on numerous occasions in the past why the use of median or media performance levels is inappropriate in setting interference protection levels. See, e.g., Gen. Docket 85-172, Further Reply Comments of MST, at 4-5.

that UHF taboo interference should be permitted to increase to the same level as VHF interference, regardless of whether the interference is objectionable to viewers.

This type of analysis does not offer a sound basis for reevaluating the UHF taboos. At a time when all video media are striving for higher technical quality, it is simply irresponsible to consider a regulatory step that would arbitrarily impose on local television a new technical handicap or degradation. Moreover, this type of analysis would not offer any information about the relative performance of ATV receivers or NTSC receivers receiving compatible ATV or ordinary NTSC transmissions. Instead, taboo effects should be evaluated as part of the overall subjective assessment of ATV system performance and susceptibility to interference.

Finally, reexamination of the UHF oscillator taboo (n+7), based on evidence that oscillator radiation levels have been lowered should be postponed. NOI, at ¶ 75, 76. First, ATV receivers are expected to use a different oscillator frequency.^{32/} Second, the Commission's suggestion that this taboo can be relaxed is based, in part, on a preliminary laboratory study suggesting that there has

^{32/} Different oscillator frequencies would also affect the sound image taboo (h+14) channels and half-IF taboo (n+4 channels).

been a lowering of oscillator radiation levels for television receivers. NOI, at ¶ 73. The Commission's pending revision of its regulations concerning Part 15 devices, Revision of Part 15 (General Docket 87-389), 2 FCC Rcd. 6135, 6139 (1987), would substantially lower the signal limits for oscillator frequencies so that improvements in receiver performance would be mandatory, and not dependent on the trend indicated by the preliminary study. Moreover, the Commission has solicited comments in that Docket on whether receiver manufacturers can economically comply with these lower emission levels, whether a grandfather period should be imposed, and what the length of such a period should be. Id. Accordingly, relaxation of this taboo can most appropriately be addressed after more is known about the ATV systems under development and after the emission level which will be applicable to future receivers is resolved.

In light of these considerations, MST believes that taboo susceptibility should be one of the considerations in the overall evaluation of ATV systems. This evaluation may indicate that relaxation of certain taboos is possible, or necessary, in order to obtain desirable trade-offs in terms of the quality of the system or spectrum availability. But these possibilities can be addressed only after there has been further development and testing of ATV systems.

IV. STANDARDS, FLEXIBLE ALLOCATIONS,
AND INTERFERENCE RIGHTS.

The last phase of the industry development and evaluation effort involves analysis of all the information on existing ATV systems to prepare proposed standards for terrestrial ATV. At present, however, there are too many uncertainties to address the issue of ATV standards in any productive and meaningful way.

Accordingly, MST urges the Commission to postpone consideration of these issues until the process of developing proposed standards has been completed. For similar reasons, MST believes it is also premature to relax NTSC standards. And MST wishes to express its strong reservations to any schemes that would involve the flexible allocation of broadcast spectrum or private arrangements altering interference rights. These proposals are not only generally contrary to the public interest, but might altogether preclude the economical implementation of ATV.

A. Alteration Of NTSC Standards May Well Be
Necessary Or Desirable in the Future Based
On Results Of ATV Testing, But Would Be
Premature at Present.

The testing and evaluation process that is under-way will assist in making decisions on whether new NTSC or ATV standards should be adopted, whether the standards should encompass one or several ATV systems, and how compatibility criteria for ATV systems can best be defined. NOI, at ¶ 98. It will also examine how the ATV systems used

by VCRs and other non-broadcast media will affect and be affected by the standards for local broadcast ATV. NOI, at ¶ 88.^{33/} But these issues cannot be resolved until the various systems under development have been thoroughly tested and evaluated. Indeed, focusing on standard setting or relaxing the current NTSC standards would be counterproductive at this stage.

For the same reason, all of the alternatives for implementation of ATV should be kept open. As discussed above, MST agrees with the Commission that the compatibility of any ATV system with NTSC receivers should be given great decisional significance in evaluating various systems. NOI, at ¶ 83. But until the development of compatible systems is completed and they are tested, proven feasible, and their performance is compared to other systems, simulcast of NTSC and incompatible ATV, NOI, at ¶ 84, the use of inexpensive converters, NOI, at ¶ 85, and other alternatives should all be examined and pursued.

^{33/} Because of the flaws in the premise of this study and the need to await further information on ATV systems before reevaluating the taboos, MST is not offering a comprehensive critique of this study at this time. MST notes, however, that the data reported reflect measurements of median receiver levels. MST has noted on numerous occasions in the past why the use of median or media performance levels is inappropriate in setting interference protection levels. See, e.g., Gen. Docket 85-172, Further Reply Comments of MST, at 4-5.

Relaxation of the mandatory NTSC standard at this time, as suggested in the NOI, NOI, at ¶ 98, would not aid, and may affirmatively hinder, the eventual implementation of ATV systems. Although the evaluation process may eventually indicate that relaxation of the current standards would facilitate the introduction of ATV service, it is too early to determine whether or what kind of relaxation is appropriate. Relaxation at this time is unlikely to facilitate the introduction of ATV systems, NOI, at ¶ 91, since it will be some time before the systems currently under development can be implemented on anything other than an experimental basis. In the meantime, it is important to encourage compatibility with the present NTSC system and preserve the benefits that have been provided by these standards. Relaxation or making the standards voluntary would only create the possibility for confusion within the existing system, when the focus should be on stimulating development and analysis of future systems.

MST believes that eventually the development of standards for universal compatibility of ATV systems used by local broadcasters and other media will become extremely important. The NTSC standards that have served broadcasters for the past forty years testify to the benefits provided by standards in fostering both competition and efficiency. But the long period of research which preceded the adoption of the NTSC standard demonstrates the necessity of thorough

analysis before attempting to formulate such standards. Standards for ATV should produce similar benefits, but should be addressed only after more is known about the ATV systems currently under development.

B. Flexible Allocation of Augmentation Spectrum.

The NOI suggests that, if additional spectrum capacity is found to be necessary for ATV television, licensees might be allotted such additional spectrum and given the "opportunity and incentive to utilize portions of this capacity for non-ATV uses." NOI, at ¶ 105, Quests. 24, 25. Although analogized to broadcaster's current use of subcarriers that are compatible with broadcast use, the "flexible allocation"^{34/} suggested in the NOI contemplates authorizing licensees to use spectrum for other services that would preclude the use of this spectrum for ATV. Id., at ¶¶ 102-108.

As noted above, MST believes it is premature to make any spectrum allocation decisions until the spectrum needs and interference characteristics of ATV systems are examined. Only then can the feasibility, advantages and disadvantages of authorizing the use of augmentation

^{34/} Further Sharing of the UHF Television Band, 101 F.C.C. 2d 852, 871-878 (1985) (proposing "flexible use" of UHF channels); see also Memorandum Opinion and Order in File No. DBS-DR-1, 1 FCC Rcd. 977 (1986) (authorizing nonconforming use of DBS channels).

spectrum for a patchwork of nonconforming uses be properly analyzed. Furthermore, MST believes that regardless of the ATV system that is ultimately adopted, such an allocation scheme would present legal and practical difficulties.

The advent of ATV technologies represents a crucial "crossroads" that raises enormously complex technical, economic and policy implications that are only beginning to be analyzed. It would be both dangerous and inappropriate for the Commission to choose this area to abandon its "traditional spectrum allocation decision making framework," NOI, at ¶ 103, and experiment with authorizing the discretionary use of spectrum for any one of a number of incompatible and vastly different services. Certainly such a radically new approach to spectrum management could not be seriously considered until far more is known about the amount of augmentation spectrum required, the propagation and interference characteristics of this spectrum, and the economics of implementing ATV service.

Indeed, giving licensees discretion in the use of augmentation spectrum may ultimately impair the implementation of ATV systems. The transaction costs of subdividing, distributing and reassembling spectrum blocks are likely to be quite substantial. This problem will be especially acute if the flexible user is permitted to subdivide his channel into smaller fragments with subleases of varying terms. Once a channel is scattered among

numerous users and perhaps numerous services, reassembling the pieces may become virtually impossible.

Moreover, it is unlikely that this type of allocation will enhance the chances of arriving at a "globally optimum" allocation of spectrum, NOI, at ¶ 104, or produce genuine efficiency or flexibility in spectrum usage. The allocation of frequencies may prove to be "flexible" only in the short term, with initial users becoming entrenched and unresponsive to market forces. Any particular use of the spectrum is likely to involve a substantial investment in equipment and institutional infrastructure. Potential investors will demand long-term arrangements that will allow them to amortize these expenses. The cost of dislodging them in order to respond to evolving consumer demand may therefore become prohibitive, resulting in inefficient spectrum use.

Nationwide implementation of ATV may be essential to the ultimate success of any future broadcast ATV service. Although not all broadcasters will implement the service simultaneously, a certain critical mass will be necessary to make the service economically and technically viable. The prospect of universal or near-universal service in the long run is necessary to attract the support of advertisers and investment in programming and transmission facilities. A flexible allocation scheme provides incentives for fragmentation that could deny ATV service to the majority

who want it in order to preserve the options of a smaller group of marginal participants in the market. At most, any nonconforming uses of augmentation spectrum should be temporary and transitional, with broadcast use of all augmentation spectrum required at some date in the future.

In addition, the uncertainties that must be resolved before flexible use could be considered are legion. Determining whether flexible use of this spectrum is feasible will require detailed information on the interference characteristics of ATV systems, both in terms of their susceptibility to interference from other services and the interference they may create to other services, such information will not be available for some time. Complex and carefully crafted protection criteria must be established in advance in order to make any flexible use scheme workable. See Further Sharing of UHF Television Band, 101 F.C.C. 2d 852, 871 (1985). Indeed, the Commission is still trying to resolve the interference problems created by adjacent land mobile and broadcast allocations. See MM Docket No. 87-465 (announced October 20, 1987). It will be impossible to determine whether flexible use is even possible until inter-service protection criterion are established.

The need for additional enhancement spectrum would also have to be determined before the appropriateness of a flexible allocations scheme could be considered. As noted

above, it seems apparent that the systems now under development represent the first step in improvements in television technology that may require additional augmentation spectrum in the future.

The legal uncertainties created by the flexible approach are equally troubling. The Commission has a responsibility to allocate the spectrum among various uses in the public interest, after affording notice and an opportunity for public comment. See 47 U.S.C. § 303. Congress has recently reaffirmed that the Communications Act does not permit the Commission to abdicate these basic decisions to the private marketplace. Communications Act. See Sen. Rep. No. 301, 99th Cong. 2d Sess. (1986).

Yet the flexible allocation scheme outlined in the NOI bears substantial resemblance to the Commission's proposed legislation to delegate allocation decisions to the marketplace through spectrum auctions -- a scheme that the Commission has already indicated will require additional legislation. E. Kwerel, A. Felker, OPP/FCC Working Paper 16, at 20-21 (May, 1985). Moreover, any flexible allocations attempted without special authorizing legislation would create the anachronism of a license renewal process in which the Commission would face the impossible task of comparing licenses involving fundamentally different uses of the spectrum. See General Docket 85-172, Comments of MST, at 33-36 (filed July 11,

1986). As a result, the Commission would not eliminate the need for it to evaluate competing uses; only shift the decisions to individual license renewals.

C. Private Negotiation of Interference Rights

The NOI also suggests that the Commission might authorize private arrangements altering co-channel and adjacent channel interference and UHF taboo protections. NOI, at ¶¶ 110-113; Quests. 26-28. As in the case of flexible allocations, the issues raised in the NOI regarding private agreements on interference rights and responsibilities cannot be adequately addressed until more is known regarding the spectrum requirements, interference characteristics and implementation problems of ATV systems. And like flexible allocations, private interference agreements appear to raise numerous problems and uncertainties.

MST believes that it is generally not in the public interest to give unfettered freedom to private parties who are FCC broadcast licensees to trade in interference rights, effectively buying and selling portions of their service areas. In spectrum allocation decisions, the public interest in the universality of the local broadcast system may diverge substantially from private party interests. Private parties should not be permitted to bargain away public interest considerations on the basis of self-interest.

Strictly as a matter of policy, there is no reason to expect that private licensees will generally reach arrangements which will tend to maximize the public interest. Licensees would be making agreements based on limited information and under the influence of private economic incentives that will discourage continuing service to rural areas and viewers that appear to be less attractive to advertisers.^{35/} The Commission, on the other hand, has consistently recognized that the "public interest" favors licensing policies which promote universal service and has "long been concerned that the poor, persons in sparsely populated areas, and members of minority groups not be excluded from access to at least a minimum level of video services." Economic Relationship Between Television Broadcasting and Cable Television, 71 F.C.C. 2d 632, 644 (1979). This public interest generally would not be served by the authorizing licensees to trade away the interference protection for their service area.

Nor is it clear that broad authorization of private arrangements can be reconciled with the Commission's legislative mandate. NOI, Quest. 27. It is clear that licensees do not have property rights in their service area. 47 U.S.C. § 309(h). The Commission has the

^{35/} See Inquiry and Proposed Rulemaking; Deregulation of Radio, 44 Fed. Reg. 57636, 57653-59 (1979).


responsibility under the Communications Act to guarantee a fair, efficient and equitable distribution of broadcast services among the various communities of the nation. 47 U.S.C. § 307(b). It cannot abandon this responsibility to the marketplace in a way that may reduce or eliminate local service to many communities. The Commission also has the responsibility under Section 309 to authorize modifications to a license only if it finds that they are in the public interest. Unless there were compelling reasons showing that private agreements modifying licenses by relaxing interference rights would be in the public interest, such private arrangements should not be authorized.

Nor should the Commission abdicate its responsibility to guarantee the technical quality of broadcast services by authorizing private arrangements that would be enforced in other forums. NOI, at ¶¶ 110-113, Quest. 29; Technical Assignment Criteria for the AM Broadcast Service, at ¶ 58, Quests. F, G. The Radio Act of 1927 and the Communications Act of 1934 were enacted with the primary purpose of ending the chaos and confusion in the airwaves that had resulted from leaving interference questions in private hands. Nothing is more fundamental to the mission of the FCC than applying its expertise as the "traffic officer" of the electromagnetic spectrum. Agreements regarding broadcast service area protections cannot be treated as ordinary contracts to be left to the

courts as enforcers of private arrangements. Courts are not equipped to deal with the technical complexity of disputes that arise in this area. Moreover, hundreds of different state and federal courts will take inconsistent (and occasionally mistaken) approaches to resolving individual problems. Without a centralized authority able to oversee the effects of each individual situation on the interrelationships of the entire broadcast system, the inevitable result would be a degradation of the quality of service.

Respectfully submitted,

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APPENDIX A

Description of Proposed Systems

The following sets forth a brief description of the ATV systems currently under development of which MST is aware which may have the capability to provide quality competitive with systems non-broadcast video media will be able to deliver in the near future. All of these systems have the capability to deliver a wider aspect ratio and/or increased luminance. In addition to the special transmission techniques noted below to increase the amount of video information transmitted, all of these systems incorporate camera and/or receiver improvements to enhance the quality of pictures displayed from the transmission.

Several of the systems identified in the Commission's Notice of Inquiry on Advanced Television Systems ("NOI") are not included here because they are, for various reasons, no longer being actively pursued. This includes the systems proposed by Bell Laboratories, NOI, at ¶ 34, CBS, Inc., NOI, at ¶ 35, and the Osborne Compression System, NOI at ¶ 36.

In addition to the systems described here, NHK has recently announced that it has developed an improved television system using MUSE-bandwidth compression techniques that could use 6 MHz broadcast channels but would deliver a picture quality inferior to NHK's 8.1 MHz MUSE system. It should also be noted that the Japanese

Broadcasting Technology Association ("BTA") is actively considering the implementation of a number of different enhanced television system improvements that would be compatible with present NTSC systems being used in Japan.

I. Single Channel, Receiver-Incompatible Systems^{1/}

NHK MUSE System

Bandwidth: 8.1 MHz

Aspect Ratio: 5:3

Scanning Lines: 1125

Scanning technique: 2:1 interlace.

Field frequency: 60/sec.

Audio system: Digital, compact-disk quality.

Stage of development: Experimental equipment already
constructed and tested. Regular broadcasting by DBS
scheduled to begin in early 1990.

Transmission techniques: Luminance and color

difference signals are band limited and then sampled in
a process called Multiple Sub-Nyquist Encoding (MUSE).
Frame stores in receiver are used to reconstruct
high-resolution wide aspect ratio picture from samples.
Transmission cannot be viewed on NTSC receivers without
a converter.

^{1/} As used here, "receiver-compatible" is limited to
systems that are designed to be received by existing NTSC
receivers without any converter, and display an NTSC quality
picture with no appreciable loss of quality.

II. Single Channel, Receiver-Compatible Systems

Del-Rey Group System

Bandwidth: Conventional NTSC Channel.

Aspect Ratio: 14:9

Scanning Lines: 828

Scanning technique: 2:1 interlace; progressive or
psuedo-progressive scanning at camera.

Field frequency: 60 (59.94)/sec.

Audio system: Digital sound.

Stage of development: Successful computer simulation
already conducted. Anticipate construction of hardware
in 1988 contingent on sufficient funding.

Transmission technique: Sampling pattern uses "subpixels"
in which six subpixel samples occupy the area of one
pixel in present NTSC system. One sixth of the
subpixel samples are transmitted with each field and
reconstructed with field stores in receiver to increase
resolution. Wider aspect ratio is achieved by cropping
4:3 aspect ratio picture to 14:9 ratio. Digital sound
is transmitted in extra horizontal lines that are not
needed for image transmission.

Matsushita System

Bandwidth: Conventional NTSC channel.

Aspect Ratio: 4:3 if luminance bandwidth is improved
or system can be used to expand aspect
ratio to 16:9.

Scanning Lines: 525

Scanning technique: 2:1 interlace.

Field frequency: 60 (59.94)/sec.

Audio system: Same as conventional NTSC.

Stage of development: Computer simulations of still
pictures have been completed in Japan. Computer
simulations of moving pictures and construction of
hardware is currently in progress.

Transmission technique: Quadrature modulation of picture
carrier creates 1 MHz of additional bandwidth which can
be used to increase luminance bandwidth to or to expand
aspect ratio.

RCA/NBC/Sarnoff Laboratories System

Bandwidth: Conventional NTSC Channel.

Aspect Ratio: 5:3

Scanning Lines: Either 525 progressive or 1050
interlace.

Scanning technique: 2:1 interlace for 1050 lines; 1:1
progressive for 525 lines.

Field frequency: 60 (59.94)/sec. for interlace; 30/sec.
for progressive.

Audio system: Undetermined.

Stage of development: Successful computer-simulations
have been conducted. Hardware for field tests is now
under construction.

Transmission technique: Additional information used to
construct side panels and luminance and chrominance
"helper" signals are transmitted through a combination
of quadrature-phase modulation of NTSC picture carrier
and introducing additional subcarriers.

III. Two Channel, Receiver-Compatible Systems

New York Institute of Technology (Glenn) System

Bandwidth: One NTSC channel and 2.75 or 5.3 MHz
augmentation channel.

Aspect Ratio: 5:3

Scanning Lines: 1125

Scanning technique: progressive or interlace, progressive
preferred.

Field frequency: 60 (59.94)/sec.

Audio system: Undetermined.

Stage of development: Hardware for field experiments
expected to be available in 1988.

Transmission technique: "Detail" information necessary to
upgrade to HDTV-quality is transmitted in augmentation
channel at lower temporal rate of 15 or 30 fields/sec.
Wider aspect ratio is achieved by extending video into
horizontal blanking interval and cropping the height of
the 525 line image to convert 4:3 ratio to 5:3.

North American Phillips Corporation System^{2/}

Bandwidth: Conventional NTSC channel and
augmentation channel that fits within 6
MHz channel

Aspect Ratio: 16:9

Scanning Lines: 525

Scanning technique: progressive.

Field frequency: 60 (59.94)/sec.

Audio system: Digital stereo sound.

Stage of development: Hardware for field testing expected
to be available in 1988.

Transmission technique: Augmentation channel transmits
information to construct side-panels for wider aspect
ratio and improve horizontal and vertical resolution of
the primary NTSC channel.

^{2/} A companion system designed for satellite-delivery
systems, called HDMAC-60, is also being developed by
Phillips Laboratories. NOI, at ¶ 37.

- APPENDIX B -

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In re Impact of)
Advanced Television)
Technologies on the)
Local Broadcast System)

In the Matter of)
Further Sharing of the UHF) General Docket No. 85-172
Television Band by Private) RM-3975
Land Mobile Radio Services) RM-4823

PRELIMINARY AND PARTIAL STUDY OF THE USE
OF THE UHF BAND TO ACCOMMODATE
LOCAL HIGH DEFINITION TELEVISION

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March 10, 1987